





**Figure 1**  
ORTEP (Johnson, 1976) plot of (I). Displacement ellipsoids are drawn at the 50% probability level and H atoms are shown as spheres of arbitrary radii.

are isostructural. The structure of cinchonidine has been described in detail; a similar description applies here.

## Experimental

Cinchonidine (60.0 mg, 0.202 mmol), tetrahydrofuran (30 ml) and an appropriate amount of the catalyst Pt-PVP- $\alpha$ -Al<sub>2</sub>O<sub>3</sub> were placed in a stainless steel autoclave (60 ml) along with a stirring bar. The autoclave was evacuated and flushed five times with hydrogen (99.995%) before it was filled with hydrogen. The autoclave was heated and stirring commenced. The reaction was quenched by immersing the autoclave in cold water. The solid that was obtained from the hydrogenation reaction was washed with water, dried and purified with ethanol. Crystals (m.p. 542–545 K) were obtained by the slow evaporation (over two months) of a chloroform solution of the compound. Elemental analysis: C 76.64, H, 8.47, N 9.16%; calculated for C<sub>19</sub>H<sub>24</sub>N<sub>2</sub>O: C 76.98, H 8.16, N 9.45%. <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>, *J* in Hz):  $\delta$  0.79 (*t*, 3H, *J* = 7.5), 1.22 (*m*, 2H), 1.48–1.62 (*m*, 3H), 1.68–1.82 (*m*, 3H), 2.44 (*m*, 1H), 2.66 (*m*, 1H), 3.08 (*m*, 2H), 3.61 (*m*, 1H), 5.79 (*d*, 1H, *J* = 3.3), 7.69 (*m*, 1H), 7.76 (*d*, 1H, *J* = 4.5), 7.81 (*m*, 1H), 7.96 (*d*, 1H, *J* = 8.7), 8.06 (*d*, 1H, *J* = 8.7), 8.88 (*d*, 1H, *J* = 4.5).

### Crystal data

C<sub>19</sub>H<sub>24</sub>N<sub>2</sub>O  
*M<sub>r</sub>* = 296.40  
 Orthorhombic, *P*2<sub>1</sub>2<sub>1</sub>2<sub>1</sub>  
*a* = 10.518 (1) Å  
*b* = 20.610 (2) Å  
*c* = 7.4612 (8) Å  
*V* = 1617.4 (3) Å<sup>3</sup>  
*Z* = 4  
*D<sub>x</sub>* = 1.217 Mg m<sup>-3</sup>

Mo *K* $\alpha$  radiation  
 Cell parameters from 1148 reflections  
 $\theta$  = 2.1–18.5°  
 $\mu$  = 0.08 mm<sup>-1</sup>  
*T* = 295 (2) K  
 Rod, colorless  
 0.39 × 0.14 × 0.13 mm

### Data collection

Bruker SMART APEX area-detector diffractometer  
 $\varphi$  and  $\omega$  scans  
 Absorption correction: none  
 8440 measured reflections  
 1663 independent reflections

1533 reflections with *I* > 2 $\sigma$ (*I*)  
*R*<sub>int</sub> = 0.050  
 $\theta$ <sub>max</sub> = 25.0°  
*h* = -11 → 12  
*k* = -17 → 24  
*l* = -8 → 8

### Refinement

Refinement on *F*<sup>2</sup>  
*R*[*F*<sup>2</sup> > 2 $\sigma$ (*F*<sup>2</sup>)] = 0.072  
*wR*(*F*<sup>2</sup>) = 0.160  
*S* = 1.29  
 1663 reflections  
 200 parameters  
 H-atom parameters constrained

$w = 1/[\sigma^2(F_o^2) + (0.0633P)^2 + 0.5083P]$   
 where  $P = (F_o^2 + 2F_c^2)/3$   
 $(\Delta/\sigma)_{\max} = 0.001$   
 $\Delta\rho_{\max} = 0.21 \text{ e } \text{Å}^{-3}$   
 $\Delta\rho_{\min} = -0.15 \text{ e } \text{Å}^{-3}$

**Table 1**

Selected geometric parameters (Å, °).

O1—C8	1.413 (5)	C7—C8	1.542 (6)
N1—C1	1.469 (5)	C8—C13	1.520 (6)
N1—C5	1.474 (5)	C9—C10	1.521 (7)
N1—C7	1.483 (5)	C11—C12	1.407 (7)
N2—C11	1.311 (7)	C12—C13	1.361 (6)
N2—C19	1.356 (7)	C13—C14	1.428 (6)
C1—C2	1.552 (6)	C14—C15	1.407 (6)
C2—C9	1.517 (6)	C14—C19	1.427 (6)
C2—C3	1.539 (7)	C15—C16	1.348 (6)
C3—C6	1.525 (6)	C16—C17	1.400 (7)
C3—C4	1.533 (6)	C17—C18	1.360 (7)
C4—C5	1.529 (6)	C18—C19	1.411 (7)
C6—C7	1.544 (6)		
C1—N1—C5	107.8 (3)	O1—C8—C13	111.1 (4)
C1—N1—C7	107.4 (3)	C7—C8—C13	110.7 (3)
C5—N1—C7	111.4 (3)	C2—C9—C10	112.9 (5)
C11—N2—C19	116.1 (4)	N2—C11—C12	125.4 (5)
N1—C1—C2	112.0 (4)	C11—C12—C13	119.7 (5)
C1—C2—C3	106.6 (4)	C12—C13—C14	117.5 (4)
C1—C2—C9	113.1 (4)	C8—C13—C12	121.8 (4)
C3—C2—C9	115.1 (4)	C8—C13—C14	120.7 (4)
C2—C3—C4	107.6 (4)	C13—C14—C15	124.6 (4)
C2—C3—C6	110.9 (4)	C13—C14—C19	117.9 (4)
C4—C3—C6	108.2 (4)	C15—C14—C19	117.5 (4)
C5—C4—C3	107.2 (4)	C14—C15—C16	122.3 (5)
N1—C5—C4	112.4 (3)	C15—C16—C17	120.4 (5)
C3—C6—C7	109.1 (3)	C16—C17—C18	119.5 (5)
N1—C7—C6	110.4 (3)	C17—C18—C19	121.8 (5)
N1—C7—C8	112.1 (3)	N2—C19—C14	123.3 (5)
C6—C7—C8	114.2 (4)	N2—C19—C18	118.2 (4)
O1—C8—C7	110.4 (3)	C14—C19—C18	118.5 (5)

The orthorhombic cell axes [10.518 (1), 20.610 (2) and 7.4612 (8) Å] were arranged in a non-standard setting to match those of cinchonidine [10.941 (3), 20.883 (4) and 7.130 (2) Å] (Oleksyn, 1982), in the absence of significant anomalous dispersion effects Friedel pairs were merged. H atoms were placed at calculated positions (aromatic C—H = 0.93 Å and *U*<sub>iso</sub>(H) = 1.2*U*<sub>eq</sub>(C), methine C—H = 0.98 Å and *U*<sub>iso</sub>(H) = 1.2*U*<sub>eq</sub>(C), methylene C—H = 0.97 Å and *U*<sub>iso</sub>(H) = 1.2*U*<sub>eq</sub>(C), methyl C—H and *U*<sub>iso</sub>(H) = 1.5*U*<sub>eq</sub>(C), and O—H = 0.85 Å and *U*<sub>iso</sub>(H) = 1.2*U*<sub>eq</sub>(O)], and were included in the refinement in the riding-model approximation. The hydroxyl group was rotated to fit the electron density.

Data collection: SMART (Bruker, 2002); cell refinement: SAINT (Bruker, 2002); data reduction: SAINT; method used to solve structure: atomic coordinates taken from isostructural cinchonidine

(Oleksyn, 1982); program(s) used to refine structure: *SHELXL97* (Sheldrick, 1997); molecular graphics: *ORTEPII* (Johnson, 1976); software used to prepare material for publication: *SHELXL97*.

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